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French Foundry Conference

In recent years, our French colleagues have held a series of conferences in the provinces, the places visited being the area around Montbeliard, Lille, and, this year, Lyons. We appreciate this system as it gives an opportunity to meet foundry owners, who rarely participate in the Paris congresses. At Lille, for instance, there were a number from Marseilles, whilst there was a new range of works to be visited. Another aspect is that the discussions tend to be of a more practical character. Mr. Rivoire, the new president of the *Association Technique de Fonderie Française*, assumed office without ceremony and, after a commendably short address, opened the conference. There was first a plenary session, addressed by Mr. Guy Hénon, who gave a masterly review of the whole subject of mould- and core-drying. Thereafter, there were two simultaneous sessions in the contiguous halls of the local laboratories of the *Centre Technique*—an ideal building, but situated rather far distant from the centre of the city.

Selecting the session covering shell moulding, we found the lecture to be somewhat elementary, but this can be readily understood as it was the first paper to be given on the subject in France, except when, at Lille two years ago, Mr. Pentz incorporated some notes on the subject in his remarks on the subject of synthetic resins. Moreover, after the lecture was over, we asked Mr. Girard, the lecturer, how many foundries there were in France which were either using the process or making experiments. His reply was the astonishing figure of about a dozen. In the other session, there was an animated discussion on the use of water-cooled cupolas. In a way, it was a pity that two such important practical subjects should clash. Other subjects chosen for discussion were spheroidal-graphite cast iron, by Mr. Grilliat and Mr. Poirot; core compounds—a thoroughly practical and interesting paper—by Mr. Nicolas; green-sand moulding of copper-base alloys, by Mr. Goret and Mr. Delanoy. A number of important foundries were visited, including Automobiles Berliet, where outsize cores were being successfully blown.

The annual banquet—and, indeed, it was well worthy of the appellation "banquet"—was held at a road-house some distance from the city. During the speeches, Mr. Olivo gave the added information about the forthcoming international conference in Florence that the cost, including transport, hotels and everything would be of the order of £4 per day. Because of attendance at a committee meeting charged with compilation of an international foundry technical dictionary, we could only participate in one works visit—to a cable factory. It was the first works of this type we had seen, and the managing director showed us with pride his newest installation—a London-made machine. There have often been grumbles about the ageing population of British foundries, but at Cables de Lyon the situation appeared to us to be more grave, especially amongst the female staff. In every way we deem these French provincial conferences, from the dual aspects of technology and sociableness, to be extremely satisfactory, and visitors from this country would be agreeably surprised at the benefits to be derived.

Death of T. Makemson

The announcement of the death on June 10 of Mr. Tom Makemson, M.B.E., the secretary of the Institute of British Foundrymen, will be a profound shock to foundrymen all over the world. Mr. Makemson, who never married, was born at Workington in 1889, and was apprenticed to the trade of patternmaking. Whilst working for Metropolitan-Vickers, Limited, he left the trade to become apprentice master. During this period he studied at the Manchester College of Technology, where he gained the Associateship award. In 1917 he joined the Institute of British Foundrymen and became a very successful honorary secretary of the Lancashire branch. In 1926, he was appointed national secretary of the Institute and, at the same time, secretary of the Manchester Association of Engineers. Under his wise direction, both these bodies progressed, the former spectacularly. Shortly after his appointment to these positions he also assumed the honorary secretaryship of the International Committee of Foundry Technical Associations and, in due course, his duties in this connection took him to America, France, Germany, Belgium, Holland, Italy, Poland and Czechoslovakia. During the war, his services were lent to the Ministry of Supply, where he ultimately became Director for Iron Castings. For this work he received the award of M.B.E. His main interests, apart from Institute affairs, were in education, especially of apprentices. He had great organizing ability and a gift for making friends. Wherever castings are made, his passing will be long and sincerely mourned.

The funeral took place last Monday at the Manchester Crematorium. Amongst those present were Mr. E. Longden, president of the Institute; Mr. John Bell, the vice-president; Mr. A. Brizon, president of the International Committee of Foundry Technical Associations; Mr. V. Delport, representing the American Foundrymen's Society. Amongst past-presidents there were Mr. V. C. Faulkner, who also represented Dr. Everest and Mr. Barrington Hooper; Dr. J. E. Hurst; Mr. J. J. Sheehan; Dr. C. J. Dadswell; whilst Mr. John Cameron and Mr. J. W. Gardom were represented by their sons. Mr. J. Butler represented the Joint Iron Council. From South Wales there was Mr. H. J. V. Williams; from Sheffield, Mr. R. F. Horton; from the West Riding, Mr. John Blakiston and Mr. G. W. Nicholls; from London, Mr. W. Wilson and Mr. W. G. Mochrie. There was a very large representation from Manchester, which included Mr. A. L. Key, Mr. J. Hogg, and Mr. G. Lambert, the assistant secretary. The chapel was completely filled with mourners.

An Appreciation, by Mr. V. C. Faulkner

Mr. Makemson—or Tom as he was known to foundrymen of half a dozen nations—was admired by all who came in contact with him for his desire always to be helpful. It was this inherent aspect of his character which made him such a brilliant organizer. Lack of such an ability can cause disappointments translated by the disgruntled into a personal discourtesy. When I first met Tom, about 1922, he was attending a lecture on foundry education. He was obviously keen on the subject and with the passing of the years, his interest became intense. In later years, he and I, with the great help of Mr. S. H. Russell, inaugurated a national recognized examination for foundry practice through the City and Guilds of London Institute. When I was president of the Institute of the British Foundrymen, in 1926, the secretaryship fell vacant, and seeking the advice of the late Mr. Oliver Stubbs, I recommended that Tom should be appointed. His success in that position over the years is too well known to warrant repetition. It was in 1926, too, that he was appointed honorary secretary of the International Committee of Foundry Technical Associations, which mainly through his untiring efforts is a healthy, enterprising organization—honoured and respected throughout the world.

His mode of life, as a bachelor, was very simple. His main hobby was his work as secretary of the Institute, which left but little free time. He was, however, passionately interested in music, especially opera and symphony concerts. At the other end of the scale, he loved the circus. He was a great walker, and such excursions included a limited amount of straight mountaineering.

When he was appointed Director of Iron Castings during the last war, his profound knowledge of the industry he served so faithfully was of great value to the country as a whole and this was recognized by the award of the M.B.E. Tom was probably the creator of the movement which gave rise to the "Garret Report". At least he realized that in the post-war era there would be severe competition for labour and that foundries would have to take on a more attractive appearance. A mental recital of all the activities undertaken by Makemson, gives rise to speculation as to how they can be fulfilled, yet he leaves behind him the methods he had evolved which need but emulation to ensure success. It is, however, in the field of personal relationship and cordial friendship, that there will remain a void never to be filled.

THE AERIAL TOWER which British Insulated Callender's Construction Company, Limited, are to design and erect for the B.B.C., at their new London Television Station at Crystal Palace is to be a self-supporting lattice-steel structure, 640 ft. high and will have a base width of 120 ft. For the first 440 ft. it will taper after the manner of the Eiffel Tower and from this point until it reaches the height of 600 ft. will be of square construction with parallel sides of 9-ft. 6-in. square section. The top 40 ft., which is also to be of square section, will have parallel sides of 2-ft. 6-in. face width.

NEW EMPLOYEES of the Aston Chain & Hook Company, Limited, Birmingham, will in future receive a booklet in which the chairman and managing director, Mr. Noel Bond-Williams, extends the invitation "Be critical of everything we do so long as you are a member of the company." Mr. Bond-Williams's own introduction is the only part of the booklet not referred to the workers and jointly agreed before publication. A 10-point statement of the company's employment policy, is included in the booklet, which also covers methods of payment of wages, health and welfare, accident prevention, and further education.

Notable Scottish Foundries

Works to be visited by I.B.F. Delegates Next Week

One of the most popular functions attaching to the annual conference of the Institute of British Foundrymen is the series of works visits arranged to foundry and engineering works of the district in which the conference is held. This year, on Thursday and Friday, June 24 and 25, parties will inspect selected foundries out of the eleven concerns in and around Glasgow which have been graciously pleased to open their premises and welcome the visiting foundrymen. So that intending visitors, as well as those unable to be present, may have advance information of what is to be seen, the following brief accounts have been compiled. The text and illustrations show them to be really notable examples of modern works.

BABCOCK & WILCOX, LIMITED

The Renfrew foundry of Babcock & Wilcox, Limited, provides a good modern example of a large "mixed" foundry engaged on quantity and jobbing production of a wide variety of castings. Completely rebuilt immediately before the war, it has since been extended and modified to keep abreast of changes in products and techniques which have taken place since then. The normal complement is about 700.

Iron Foundry

The iron foundry is capable of producing about 21,000 tons a year of castings ranging from links for chain-grate stokers up to castings of 6 tons, although 9 tons and even larger, can be handled. Stoker links are made at the rate of 30,000 per day, fully-mechanized production being used for these, and for a number of other small mass-production items. Methods include a continuous casting line served by a battery of hydraulic moulding machines and conveyor lines to the knock-out and sand recovery and to the fettling shop.

The hydraulic moulding machines used are of interest in that they produce both halves of a complete box-less mould in one squeeze, instead of the more usual separate production of cope and drag on different machines. Quantity production of small castings is also carried out in snap-flask moulds, produced by a battery of Jackman jolt-squeeze machines.

A considerable amount of hand moulding is also carried out, and there is a comprehensive installation of jolt-roll-over machines, impeller rammers,

FIG. 1.—*View of the stockbins under cover, occupying the centre bay at the Babcock & Wilcox Foundry.*

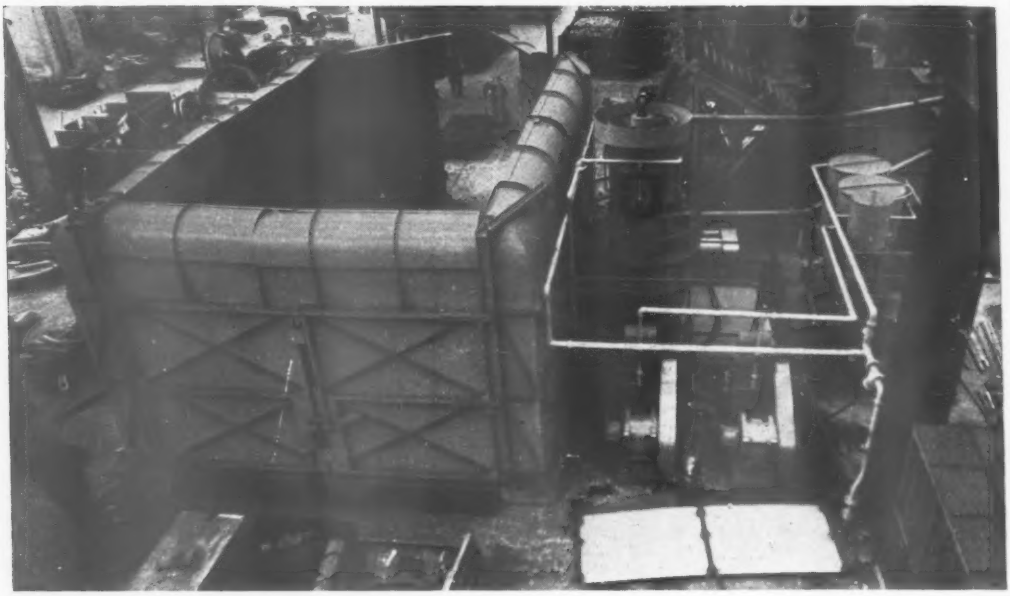


FIG. 2.—*Hydroblast plant for cleaning the larger castings at Babcock & Wilcox.*

etc. The largest casting regularly handled is a baseplate for a coal-pulverizing mill 16 ft. by 6 ft. 6 in. by 1 ft. 6 in.. An interesting item of equipment is a newly-installed gas-fired skin drier of portable design to deal with moulds too large to be conveniently handled in a drying oven. Cores are manufactured in an up-to-date coreshop, the coremakers working adjacent to a roller track which carries the cores to one of two ovens, one oil-fired having a 2¼-hr. cycle, and the other gas-fired, with a 1½-hr., drying cycle.

In the foundry, metal is provided by four, balanced-blast cupolas of 9 to 10 tons per hour capacity and a smaller one of 4-tons output, used for melting wear-resisting alloys, notably the "Ashcolite" alloy—utilized for the linings and impellers of ash pumps, which are subject to considerable abrasion. The metal stocks (Fig. 1) and cupolas are centrally situated, giving good metal distribution over the foundry, mostly achieved by drum-type insulated bogies.

The method of making-up charges for the cupolas, has many points of interest, as has the actual charging machine. This, developed and built by Babcock & Wilcox, consists of an overhead twin-rail crane with a swivelling jib, controlled from charging-platform level. The winch picks up the bucket, loaded with the correct charge, and inserts it into the shaft of the cupola. The buckets are of the bottom-opening variety and the contents may be discharged gradually, or dumped, at will.

Melting is also carried out in two 400-lb., oil-fired crucible furnaces, which are normally used on heat-resisting alloys; total production of alloy castings approximates to 10-15 tons per week.

A comparatively recent (1948) modification to the dressing or fettling department is the replacement of shot-blasting by the "Hydroblast" system utilizing jets of sand and high-pressure water (Fig. 2). This has not only very considerably reduced the time taken for fettling most castings, but enables a considerable quantity of sand—once a nuisance to dispose of—to be reclaimed, graded, dried and returned to the main foundry sand system. For stoker links, and other small castings, fettling is by means of a "Wheelabrator," rumbler/shotblast machine, after which they pass to a production line of profile and spindle buffing and grinding machines.

Steel Foundry

The steel foundry is also employed on quantity and jobbing production both, and has an output of approximately 1,800 tons per year sizes ranging from a few pounds to 4 tons. Moulding equipment includes two groups of machines with mechanical sand-handling and roller tracks. One group contains two 4,000-lb. and two 750-lb. Pneulec-Hermann jarr-ram roll-over machines for the quantity production of castings from 28 lb. to 1 ton in boxes 2- to 4-ft. square. The second group, for castings up to 28 lb. is made up of three McNab jolt-squeeze machines. A plain jolt-ram machine is used for castings up to 2½ tons. Melting is by two Siemens Schückert tilting furnaces of 3-tons and one Heroult of 15-cwt. capacity. This latter is normally employed on alloy steels (chiefly the Babcock "Calmet" alloy) and the oxygen lance is normally employed on most melts of the latter alloy.

Two types of annealing furnace are used in the

heat-treatment of castings. One is a double-ended type with two bogies, one being loaded or unloaded when the other is in the furnace. The other is of the "top-hat" type (Fig. 3), consisting of two bases, the furnace being transferred to either base at will.

CLYDE ALLOY STEEL COMPANY LIMITED

The Clyde Alloy Steel Company Limited commenced production of alloy steel at Craigneuk Works, Motherwell, in 1919 under the direction of Dr. (now Sir) Andrew McCance, F.R.S. Originally, only rolled products were manufactured, but within a few years the production of steel castings was begun and since then the mill and foundry divisions of the works have been steadily developed and enlarged.

There are now two separate foundries, which together cover the production of castings from a few pounds up to 18-tons finished weight, in any quality of alloy, stainless or plain-carbon steel. Each foundry is entirely self-contained and has its own melting equipment and all ancillary processing plant. The top weight produced in the light foundry is about 20 cwt., and the bottom weight in the heavy shop is 5 cwt., so that there is an overlap in productive capacity between these two levels. Both foundries are essentially equipped for jobbing work, but within this field the greatest possible use is made of mechanical aids to production, and semi-repetition work, therefore, becomes practicable.

Heavy Foundry

The heavy foundry draws molten metal from two electric-arc furnaces, each nominally of 10-tons capacity, the ladle and crane equipment of the shop being adequate to handle melts of up to 30 tons, for which the combined outputs of all furnaces are used. The shop is laid out on the straight-line principle, with a feeder rail service and crane facilities along the entire length. Moulds are prepared at one end of the shop (Figs. 4 and 5) and pass successively through the operations of drying, casting, knock-out, shot-blasting, annealing, fettling, testing and despatch. Extensive use is made of impeller-ramming and jolting machines to supplement hand moulding, and similar aids are used in the adjacent coreshop. Sand practice is based on closed-circuit working, using natural and synthetically-bonded sands. All used sand from the knock-out is cleaned and milled before being taken by overhead conveyor to the moulding shop for re-use. Primary cleaning of castings is done in shot-blast chambers equipped with dust-exhaust systems and wet-type dust-collectors. Annealing, normalizing and stress relieving are done in a bogey-type furnace fired with producer gas, and these treatment facilities are augmented by smaller batch-type furnaces in the bar heat-treatment department.

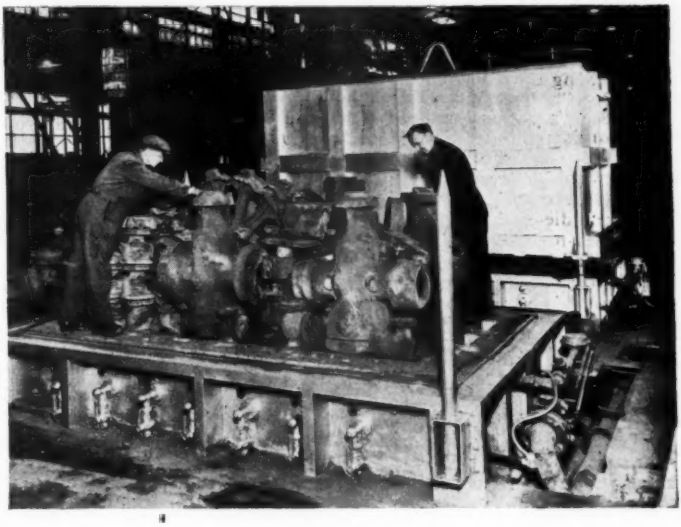


FIG. 3.—*Portable-cover furnace (Dowson & Mason Gas Plant Company, Limited) at Babcock & Wilcox, for annealing 4-ton batches of castings. Two hearths are used with one hood.*

Light Foundry

In the light foundry, only a small proportion of the capacity is devoted to floor moulding and the majority of the work is done by various mechanical methods. These comprise jolt-squeeze machines and roll-over, pattern-draw machines served by an impeller rammer. Extensive use is made of green-sand, and in this foundry also, full sand-reclamation is carried out, the installation of conveyors, mills, dust extractors and magnetic separators being housed under the foundry floor. There are two knock-out positions, one semi-mechanized and one fully automatic and the arrangement of the sand plant permits either of these to be used independent of the other. The coreshop employs mechanical aids such as coreblowers, and drying is done either in a continuous, vertical oven or in batch-type core-stoves, equipped for recirculation of flue gases. Castings are cleaned by Wheelabrator and Tumblast equipment, and also by hand shot-blasting in chambers fitted with wet-type dust-collectors. Metal for this foundry is drawn either from a 3-ton Tagliaferri furnace of the latest type, with basket charging and automatic electrode control, or from three high-frequency induction furnaces of from 6-cwt. to 1-ton capacity.

Apart from the usual metallurgical supervision and sand-control services, there are available a gamma-ray laboratory using radioactive isotope

Notable Scottish Foundries

sources, magnetic crack-detection and supersonic testing equipment. The production of alloy and stainless-steel castings necessitates complete facilities for chemical analysis and this service is supplied by the central works laboratory which also serves the mill division.

The products of the foundries cover a wide range of applications. In the lighter castings, pump bodies, impellers, mining-machinery parts, small turbines, Diesel-engine components and valves all occupy a prominent place. On the heavier side are marine-turbine casings, water-turbine runners and associated gear, cranks and webs for semi-built Diesel crankshafts, and marine propellers.

RENFREW FOUNDRIES LIMITED

Renfrew Foundries Limited is comparatively new as a commercial company, as it was not formed until the latter half of 1945. Prior to that date it had during the years of war, as an integral part of the Rolls-Royce Scottish shadow factory, produced a vast tonnage of aluminium castings for many thousands of Merlin aero-engines, manufactured in Glasgow. As with most companies of recent formation, the process of consolidation and expansion has taken time, but within seven years a reputation has been earned in all branches of British engineering, for high quality of aluminium castings in all alloys, by the various processes of sand casting, gravity-die-casting and high-pressure die-casting.

The foundry, which is numbered amongst the largest mechanized aluminium foundries in Europe, is planned as a completely self-contained unit, having under its control the manufacture of all ancillary equipment, such as sand casting patterns and both gravity- and high-pressure dies.

Engineering contracts of a highly diverse nature are undertaken and, at the present moment, the largest proportion of the civil contracts are taken by the motor industry, closely followed by the office-equipment industry, domestic equipment and marine industries.

The foundry is making in these times a special feature of the production of high-pressure die-castings, of a size and nature which some years ago were considered to be outside the capabilities of this form of die-casting. By association with the Doehler-Jarvis Corporation of America, which is acknowledged to be the largest producer of high-pressure die-castings in the world, Renfrew Foundries maintain their up-to-date knowledge of technical advancement. It is a claim of this foundry that no casting is too large, too small or too intricate, and it is hoped that the forthcoming visit will prove to members of the Institute that this is no "idle sales boast."

JOHN LANG & SONS

The firm of John Lang & Sons was founded in 1874, and the business was run by John Lang and four sons. The first building was 120 by 40 ft. and employed about 10 men making general machine-tools, in fact the place was so small that it was referred to as "the matchbox." To-day the works cover about six acres, the machining, fitting and erecting shops alone occupying about 3½ acres. Employees number about 1,000.

These new works were built in 1906, and the foundry was started for the first time. A railway-siding serves the foundry, and there is ample ground space for storage and even further expansion. The firm specializes in lathes and has made many important contributions to industry. The effect of the second world war on the general policy and layout of the firm was very slight, as the demand for lathes varies very little between peace and war conditions; the tempo was merely heightened.

Laboratory Control

All raw materials are supplied to the works direct from railway siding and throughout foundry and machine-shops a well-laid-out flow-production scheme is followed. Laboratory checks are made on all incoming foundry materials, even furnace-gas analysis, atmospheric humidity and metal-fluidity tests are covered. There is also a laboratory for sand testing and research. Daily samples are taken for slag analysis and the records of furnace operation are very comprehensive.

Ancillary departments include a fettling shop (Fig. 6), a heat-treatment shop, where nitriding can be carried on, and a patternshop; the latter being well equipped with modern woodworking tools. The machine-shops, as would be expected with a firm specializing in machine-tools, are superlatively laid out for production machining on an extremely comprehensive range of special-purpose and standard plant. Sections here are devoted separately to planing, boring, milling and slotting, and the assembly departments, likewise, are divided according to the finished product—centre lathes; surfacing and boring lathes: bar lathes, gear cutting, grinding, pneumatic equipment, etc.

SHANKS & COMPANY, LIMITED

Just over a century ago, a young Scotsman named John Shanks established a small plumbing business in the village of Barrhead, situated seven miles south-west of Glasgow. An ambitious man, resourceful and ingenious, he was not content to limit his activities to plumbing work; and soon commenced to design and assemble sanitary appliances—the brass fittings for which he manufactured in his plumbing shop. Several of his designs were very successful, and the first one he patented, in the year 1864, was a water closet—which was widely sold.

In 1868, he erected a brass foundry, followed later by an iron foundry. To these two ventures he gave his whole attention, leaving his brother and partner, Andrew Shanks, to manage the plumbing business. In 1875, the plumbing business was sold and Andrew Shanks was made a partner in the manufacturing business. In 1898, following the death of the founders, the business was converted into a limited liability company, with the sons as joint managing directors.

Since those early days, the history of the company

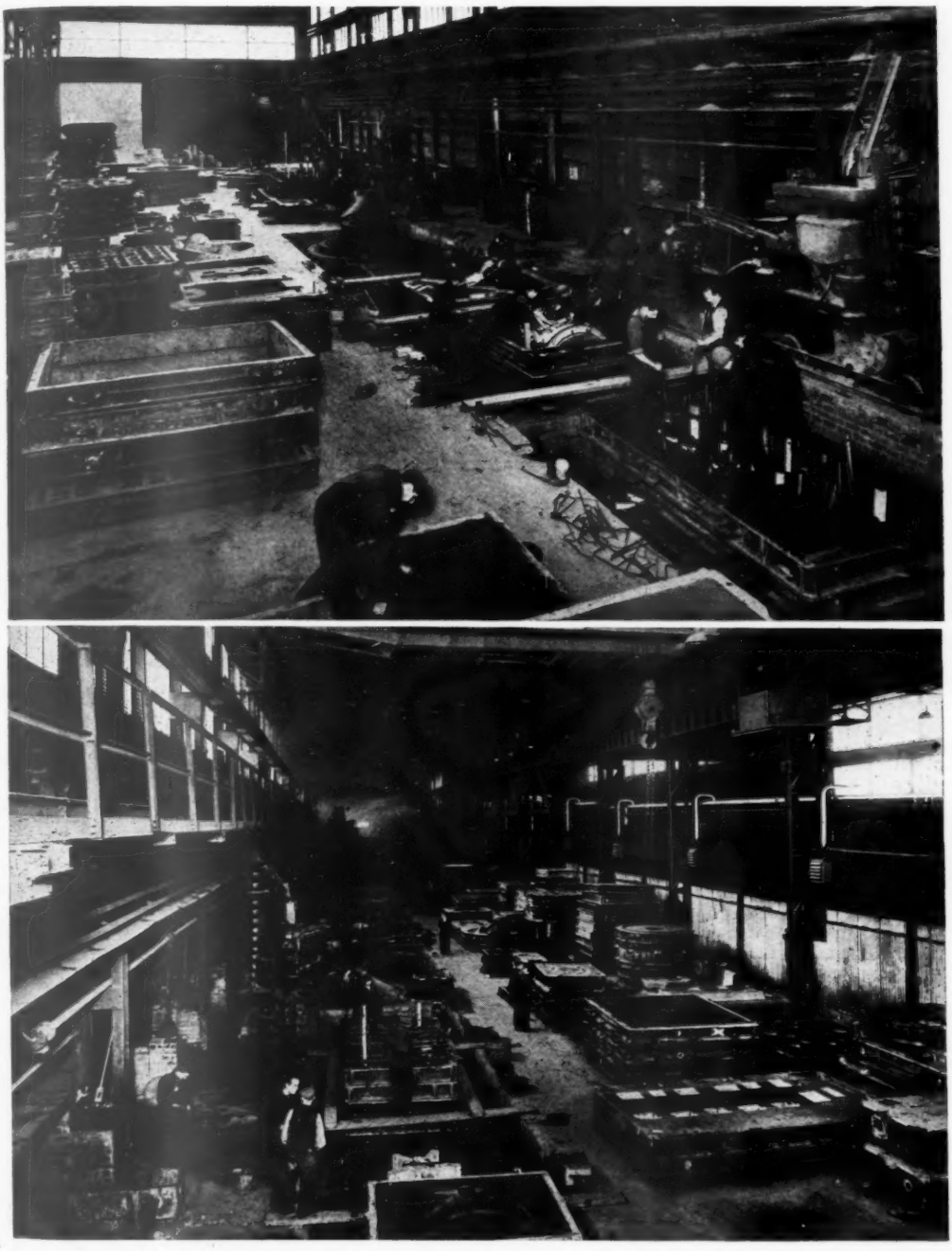


FIG. 4 (*top*).—*Work proceeding on heavy pit-moulded jobs at Clyde Alloy Steel Company, Limited.*
FIG. 5 (*bottom*).—*General view along the Clyde Alloy heavy foundry.*

FIG. 6.—*Fettling in progress on a large lathe-bed casting at John Lang & Sons Limited. Note the test-piece cast on the side of the shear.*

is indeed one of increasing expansion and technical progress. In 1900, the "Victorian" pottery was erected for the manufacture of sanitary fireclay; and in 1918 the sanitary earthenware pottery of J. & M. Craig, Kilmarnock, was acquired. A few years later, an entirely new works, consisting of brass and iron foundries and assembling shops, was erected about a mile from the old site. In the foundries, the process of brass and iron moulding is now largely mechanized, while in the machine-shops, plating and polishing shops, most up-to-date machines and labour-saving appliances are in use. In the two potteries, six continuous tunnel kilns, each capable of great output and high-quality production, are in operation.

Present-day Activities

Thus, from a humble plumber's shop, the company has grown to be one of the largest sanitary manufacturing plants in the world, employees and staff numbering in total about 2,200. The range of their products is remarkable, covering as it does vitreous china, in the manufacture of which they were the pioneers in Great Britain; earthenware and fireclay pottery goods; porcelain-enamelled cast-iron baths; (Figs. 7 and 8) cast-iron cisterns; woodwork; sheet-metal work; and fittings of all kinds in brass and other metals. Very few sanitary firms in the world manufacture so comprehensive a range of goods, all of which are necessary for the production of complete sanitary installations.

In virtue of their extensive export trade, the name of "Shanks" has become a household word all over the world. To-day, the direction of this expanding business has reached the third generation—the present managing directors being grandsons of the founders.

HARLAND & WOLFF, LIMITED

Clyde Foundry

Harland & Wolff's Clyde foundry has been in operation since 1922, and is solely employed in the production of iron castings for all types of marine and land machinery. The foundry building covers an area of 480,000 sq. ft., has a capacity of 30,000,000 cub. ft., and is divided into six bays, four of which are used for moulding, and two for storage of materials (Fig. 9).

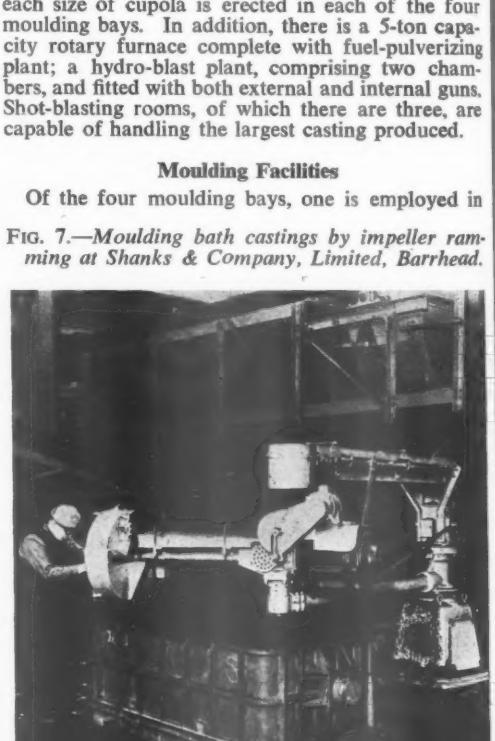
The building has the distinction, since the destruction of the Crystal Palace, of being the largest glass structure in the British Isles, the area of glass being approximately ¼ million sq. ft., equivalent to a weight of 1,200 tons. The conception of this building, with its regard for orderly routing and storing of materials, the provision of well-defined gangways, adequate lighting arrangements, marked an advance in the approach to foundry layout, and which, over the past 30 years, has proved to be equal to all demands.

The following are some of the more interesting details of the equipment:—There are 54 overhead and monorail-type travelling cranes, ranging in capacity from 2 to 60 tons; 20 drying stoves, fired by automatic stokers; four gas-fired drying stoves for small cores; eight cupolas (four of 48-in. dia., and four of 66-in. dia., capable of a melting rate of 8 tons and 15 tons per hour respectively), one of each size of cupola is erected in each of the four moulding bays. In addition, there is a 5-ton capacity rotary furnace complete with fuel-pulverizing plant; a hydro-blast plant, comprising two chambers, and fitted with both external and internal guns. Shot-blasting rooms, of which there are three, are capable of handling the largest casting produced.

Moulding Facilities

Of the four moulding bays, one is employed in

FIG. 7.—*Moulding bath castings by impeller ramming at Shanks & Company, Limited, Barrhead.*



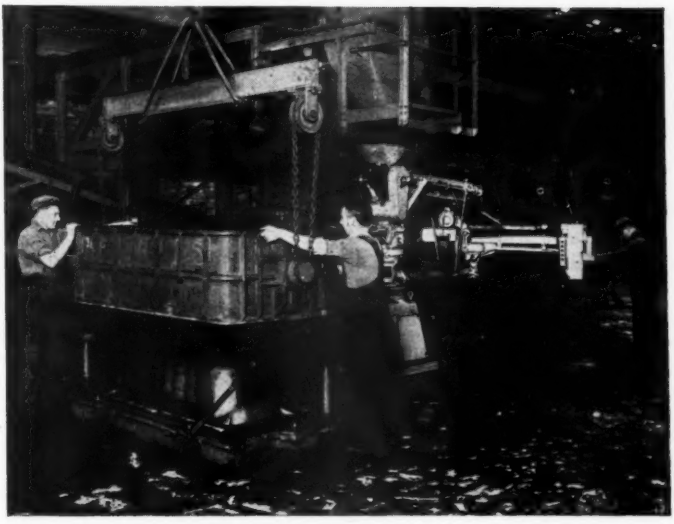


FIG. 8.—*Stripping one bath half-mould while a second is being rammed (Shanks, Barrhead).*

the production of the lightest type of work and, because of the repetitive nature of this, machine moulding is largely adopted, and many types of machines are provided, *viz.*: roll-over jolters, squeezers and shockless jar-rammers, together with an impeller rammer for the larger sizes of moulds.

In the two bays producing the heaviest type of work, permanent pits are provided. There are ten of these, size 30-ft. long by 20-ft. wide and castings up to 120 tons in weight can be handled. Fig. 9 is a view of one of the heavy moulding bays. The remaining bay is used for the production of the medium type of work and, here, there are four permanent pits 20-ft. long by 15-ft. wide, and castings up to 50 tons can be undertaken. The storage bays are serviced by railways and, in these sections, all raw materials and coke for cupolas are kept, and, also, supplies of sand. All fettling and de-coring operations are carried out in an area outwith the moulding floors and, in this department, pneumatic chippers are in constant use.

Ancillary departments include a modern pattern-shop, equipped with modern wood-working machinery, and a power station in which are installed two 4,000-cub. ft. per min. air compressors, and two 1,000-kw. rotary converters, with the necessary transformer equipment. There is also a chemical laboratory and a physical-test room for the effective control of foundry products.

Educational facilities are provided for all apprentices during their period of apprenticeship, and the youngsters have their own washing facilities and cloakroom. Washing facilities for workers have been available since the opening of the foundry.

GLENFIELD & KENNEDY, LIMITED

Glenfield & Kennedy Limited was founded in 1852 when Thomas Kennedy and three associates formed a private syndicate to exploit his invention of a water meter. Thirteen years later the syndicate was re-constituted as the Kennedy Patent Water Meter Company Limited and the Glenfield Company Limited was formed. The growth of the two concerns was rapid, especially the latter. Formed initially to supply castings to the meter company, it gradually widened its interests and eventually established an extensive valve and other hydraulic-equipment business. The two companies were amalgamated in 1899.

For many years now, the company has been one of the largest organizations devoted exclusively to the production of hydraulic control and measuring equipment, including valves, control gates and sluices, for use in water and sewerage works, hydro-electric and thermal-power plants, irrigation schemes, oil pipelines and ships, and industrial services. It has a large factory at Kilmarnock, a number of offices at home and in India, and agents in most other countries. (See Figs. 10 and 11.)

The works at Kilmarnock cover an area of about 40 acres and employ some 2,500 people. Except for steel production, they are self-contained. There are two iron foundries, light (Fig. 11), and heavy, producing castings mainly for the company's own needs. All castings are made in Meehanite metal, in grades ranging from 14 to 22 tons per sq. in. tensile.

Light Foundry

The light foundry has a capacity of 300 tons of castings per week, produced entirely by semi-skilled labour. The castings range from a few ounces to 3 tons, involving valves up to 48-in. dia. About half the shop is mechanized, being provided with a central power-driven pallet-conveyor fed with moulds, from storage gravity roller conveyors, from two rows of moulding machines. From the casting position, the conveyor leaves the foundry and travels through a lean-to tunnel to disperse the fumes from the newly cast moulds. It re-enters the foundry at the shake-out section, where, after a small amount of storage roller conveyor, the moulds pass to Sterling shake-out machines.

General Systems

Sand from the shake-out machines is taken by an underground and inclined belt to a rotary magnetic screen, whence it is passed by another inclined belt to storage hoppers situated above three 9-ft. dia. sand mills having a total capacity of 30 tons per hour. From the mills, the reconditioned sand is transported by an underground belt and bucket elevator to two overhead distribution belts which deliver it to

FIG. 9.—*Section of a heavy moulding bay at the Clyde Foundry, Govan, of Harland & Wolff, Limited.*

hoppers over the moulding machines. Electric tipping trucks convey some of the reconditioned sand to the "jobbing floor." Moulds for valves up to 16-in. dia. are all made in green-sand. Larger sizes are catered for in a small dry-sand section, in which moulds for valves up to 36-in. dia. can be jolted on a 2-ton machine. All sand in the foundry is returned to the sand plant for reconditioning and no facing sand is used. The make-up sand is a naturally-bonded Scottish rotten-rock sand, and pelleted pitch is used instead of coal-dust for the green-sand.

The heavy foundry, staffed by skilled moulders, produces up to 70 tons of castings per week. It is equipped with 30- and 60-ton overhead cranes, and castings have been produced up to 32 tons in weight. A casting pit 32-ft. deep is provided for casting hydraulic rams and cylinders vertically, the former have been cast up to 45 ft. long. Loam moulded work is made extensively, and wherever possible use is made of semi-permanent moulds. The department is very well equipped with drying stoves and practically all moulds which require to be dried can be accommodated.

The melting capacity for the two foundries comprises five cupolas, three 48-in., one 60-in. and one 27-in. dia. Two furnaces are blown each day. Charging into the furnaces is by hydraulic crane direct from a weighbridge at ground level, using tipping skips which are discharged into a chute on each furnace. Charges are weighed by a recording weighing machine, each ingredient being recorded; the weighman directing operations through a loudspeaker. The dressing shop for the two iron foundries which is a separate building, is equipped with two impeller-type cleaning machines, and a cabinet machine is in process of being installed. Its capacity is sufficient to ensure that each day's output of the foundries is cleared daily. Most waterworks valves are tarred after leaving the dressing shop. Castings which are not required to be tarred, but which will be painted subsequently, are dipped in a phosphate bath.

In addition to the two iron foundries, there is a non-ferrous foundry, which produces up to 40 tons of metal per week. Roughly half of this tonnage is in the form of billets of high-tensile brass from which sluice-valve spindles are forged. The castings are entirely used for fluid-handling equipment, consequently a large range of alloys is catered for in order to take care of the many corrosion problems which arise in this type of work. The furnaces here include one 10-cwt. Sklenar oil-fired unit, three oil-fired and three coke-fired Morgan tilting 400-lb. units, and four pit type models of 200-lb. capacity each. The largest non-ferrous castings made weigh approximately 25 cwt.

Control

The whole of the foundry activities are under close laboratory control, the greatest importance being attached to the choice of raw materials and to the handling of these materials during the various stages of manufacture. All classes of cast-iron, cast-steel and gunmetal valves up to 14-in. dia., together with a wide variety of other products, such as meters, water-level indicators and recorders, hydrostats and fire hydrants, are now

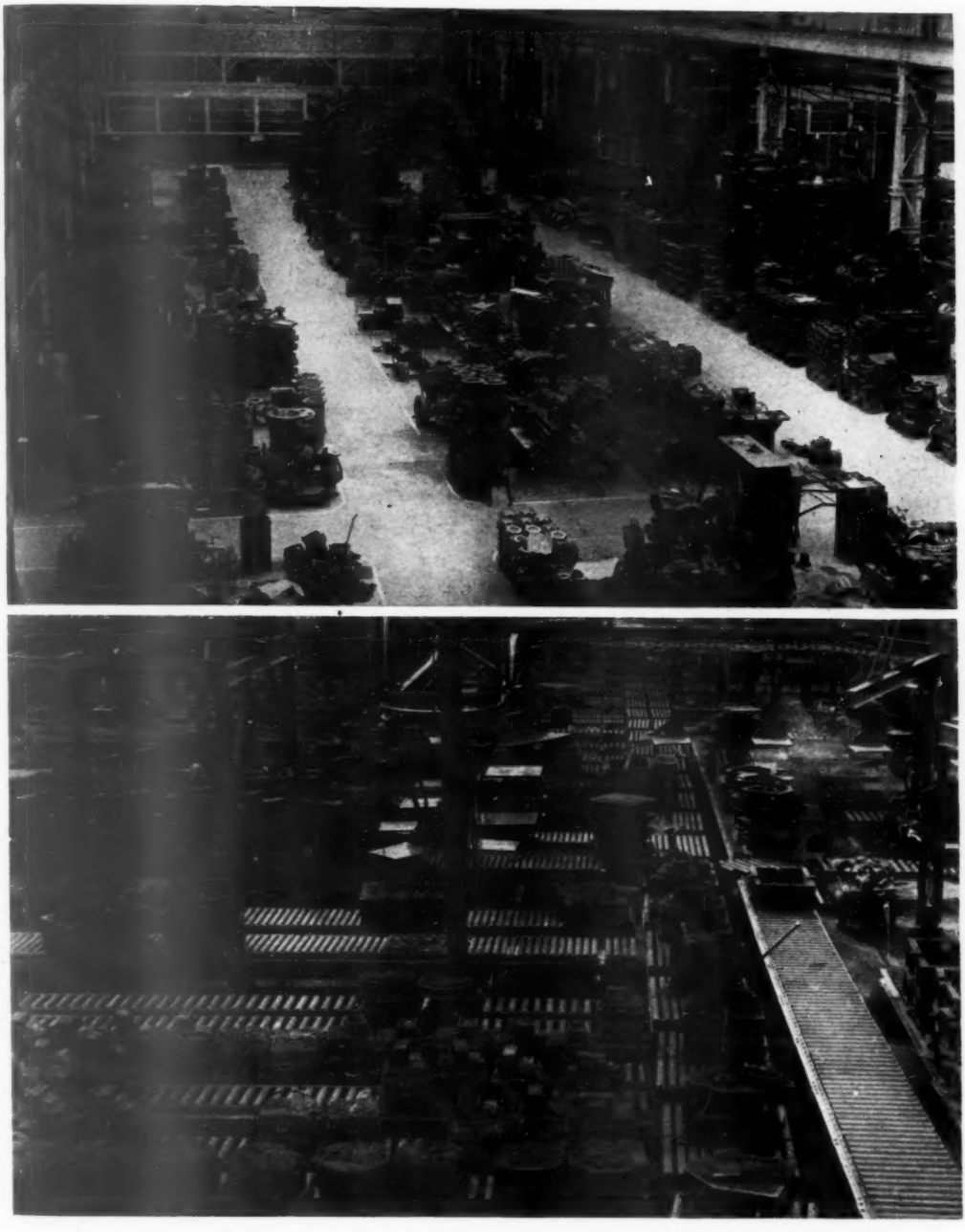


FIG. 10 (*top*).—*One of the bays in the light machine-shop at Glenfield & Kennedy Limited, Kilmarnock, and* (*bottom*) FIG. 11 *general view of the light foundry mechanized section of the same works.*

manufactured and tested in a single workshop block, under one roof. The block, for which it was necessary to demolish completely three large brick buildings housing the old light-engineering department (Fig. 10) is arranged in five bays each 400-ft. long by 60-ft. wide, with an annex—the test bay—250-ft. long by 50-ft. wide.

The machines have been arranged to facilitate, wherever practicable, line-production on a batch basis. Thus, they are laid down in planned lines separated by clearly marked passages which all join a main passage running the full width of the building and dividing the fitting and assembly sections from the production lines. Many of the machines are new and are mostly special-purpose tools designed for a particular operation. A group of high-pressure hydraulic presses is provided for inserting the valve seats in the bodies and gates.

Adjacent to the fitting and assembly sections is an enclosed store, where finished parts are held prior to issue for assembly. Complete sets of sluice-valve components are placed on special "pallets" and passed direct to the assembly lines on roller conveyors. The hydraulic testing department is equipped with the latest equipment for the proving of all products, an instrument department is provided with precision tools of every description for the work undertaken, whilst a sub-tool room is capable of handling the requirements of all departments within that building.

Also in the building is an apprentice training school, in which each turner, fitter and pattern-making apprentice spends three months, as soon as possible after the start of apprenticeship, under a qualified instructor, learning the use of the various types of hand and machine tools. The block is equipped throughout with "daylight" fluorescent lighting designed to give a lighting intensity of from 10 to 12 ft.-candles at working level. By careful planning of the lighting it is no longer necessary to have individual machine lights, except where the special nature of the work demands them. The heating system is on the steam-and-fan-heater principle, in which fresh air is blown through steam-heated grills. The internal temperature is thermostatically controlled at 60 deg. F. In summer, the system is used for air conditioning.

Heavy Engineering Shop

The manufacture of large valves, sluices and sluice gates of the types and sizes required for waterworks trunk mains, hydro- and thermal-electric plants, irrigation and flood-control schemes and of large micro and other rotary strainers, is carried out in an extensive heavy-engineering shop. This shop, laid out in four bays, two 390-ft. long and two 300-ft. long—the latter being in the process

FIG. 12.—*Dry-sand-moulding bay at the Holm Foundry, Cathcart, of G. & J. Weir, Limited.*

of extension to 390-ft.—and each 60-ft. wide, is of all-steel construction with the roof entirely glazed and a floor of hardwood blocks and concrete. A comprehensive range of heavy machine-tools, covering planing, turning, milling and drilling of large castings and fabricated items up to 60-tons weight, is laid out to enable work to be progressed through the shop to the fitting section, and ultimately to the testing machines, where intensifiers enable test pressure up to 9,000-lb. per sq. in. to be used. A range of machines to produce detail components is also included and large fitting and assembly areas are provided.

G. & J. WEIR, LIMITED

Holm Foundry

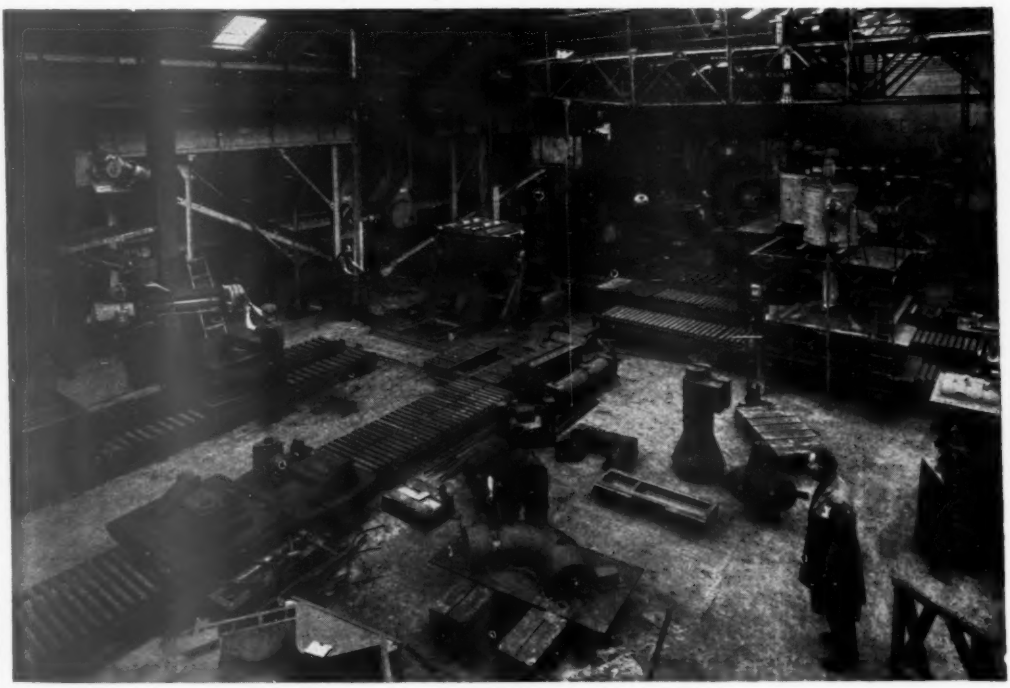
The Holm foundry of G. & J. Weir, Limited, situated at Cathcart on the south side of Glasgow, has a total area of 79,000 sq. ft., and occupies seven bays of varying length. The foundry exists to meet the requirements of the firm's engineering works, of which it forms an integral part, being engaged in the production of such castings as pump bodies, cylinders, and impellers, together with shells for heaters, evaporators, and condensers. The foundry operates in three sections—heavy, medium, and light.

Evaporator shells, in the larger sizes, account for a considerable part of the production on the heavy section. Many of these are swept-up in loam, there being four batch stoves available for drying. Shells produced from patterns are pit dried, and there are five pits in the section. Pump bodies are also cast here, and are dried in the four large pit stoves. Castings are handled up to 10 tons weight, occupying an area of 10 ft. in height by 8 ft. dia. Two 25-ton cranes and one 15-ton crane serve this section.

Castings produced in the medium section (Fig. 12) range between ½ ton and 3 tons, and all are made in dry-sand, from patterns, in moulding boxes, and stoved. The light section handles castings of from one to 10 cwt.; most of the work done in this section, too, is in dry-sand. The sand-preparation plant comprises the usual screening and magnetic separation, and is served by a 1-ton batch-type mill. The maximum use is made of a motive-type impeller rammer. In the core-shop there are two 500-lb. batch mixers, and four batch stoves. The sand is dried in a small static sand-drier.

Normal methods are employed in the dressing shop, where there is a shot-blast cabinet, newly equipped with a wet-type dust-recovery unit. Other equipment includes a cutting wheel, grinding machines, and an "airless" revolving, barrel-type shot-blast unit, in which the smaller castings are

FIG. 13.—*Sand plant, impeller ramming roll-over type machine, and skin-drying plant at the Argus Foundry, Thornliebank, of G. & J. Weir, Limited.*



cleaned. Dust from these machines is collected by "wet" methods, and disposed of as sludge. There are three large mechanical saws for the removal of headers, risers, etc.

The bulk of the metal cast in these three sections is cast iron, which is melted in two 8-ton per hr., receiver-type cupolas, served by a 2-ton charging crane. All raw materials are kept under cover. A recent installation is a briquetting machine, which produces briquettes averaging 15 lb. in weight, and having a density of 80 per cent.

Non-ferrous Work

The production of non-ferrous castings is carried out in two of the smaller bays. The melting equipment consists of one 5-ton air furnace, three 600-lb. and four 400-lb. tilting furnaces; there are, in addition, four 200-lb. pit furnaces. The metals normally cast in this section are Monel, gunmetal, heat-resisting cast iron, austenitic cast iron, and spheroidal-graphite cast iron. A recovery unit is operated to recover borings from the machine-shop, which are cleaned by centrifugal and magnetic separation, and thereafter run into ingots from the 1-ton semi-rotary furnace. These are used in metal mixtures.

Full laboratory facilities are available in the firm's main laboratory, for mechanical testing, chemical analysis, and research, but a foundry laboratory controls stove operation, cupolas, oil-fired tilting furnaces, and supervises all sand preparation. An X-ray and gamma-ray plant, situated behind the welding shop, is also used for the inspection of castings.

Argus Foundry

The Argus foundry, one of the Weir group of companies, is situated at Thornliebank, near Glasgow, the buildings occupying an area of approximately 100,000 sq. ft. The foundry—which is divided into heavy, medium, and light sections—is engaged in producing an extensive range of castings, on semi-mass-production lines, including pump bodies and impellers; high-pressure steam cylinders; compressors; cylinders, liners and pistons for Diesel engines; pipes, and miscellaneous engineering requirements. Low-phosphorus iron, stainless steel, gunmetal and bronze are the metals most widely used, but the firm holds a licence from the Mond Nickel Company, Limited, for the production of S.-g. cast iron.

The melting plant consists of two 7-tons per hr. cupolas, with receivers, one 2-ton cupola, six tilting furnaces for non-ferrous metals, and one high-frequency furnace for stainless steel. The charges are weighed on the floor then hoisted to the charging platform by means of double electric elevators. Raw materials are unloaded by electro-magnet or grab, and transferred to bins adjacent to the charging platform by means of double electric elevators.

The heavy section sand plant consists of a continuous mill, with belt conveyors, having a capacity of 25 tons per hour. There are two impeller ramming units (Fig. 13) serving three roll-over moulding machines, of 2- 3- and 5-tons capacity. The sand is fed into the system by a power shovel. A gravity conveyor serves the skin-drying unit or mould stoves, as required. The largest box handled is 7 ft. by 4 ft. by 27 in.

Medium and Light Sections

In the medium section, seven jolt-roll-over, pattern-draw moulding machines are served by a continuous mill and conveyor, and transport of moulds and boxes to the knock-out is effected by a gravity conveyor. The largest box handled is 42 in. square. The battery of seven jolt-squeeze machines in the light section is served by a continuous mill and sand conveyors, of 10 tons per hour capacity. The maximum size of box used in this section is 22 by 14 in.

A new coreshop is in the course of erection; this will include a vertical, continuous core stove, served by a pendulum conveyor. The equipment in the dressing shop includes two shot-blast cabinets and an impeller-type cleaning machine. Control over the quality of each melt is exercised by a small service laboratory adjacent to the cupolas, and all routine testing is done there. For additional services the resources of the Weir laboratory at Cathcart are available.

WILLIAM BEARDMORE & COMPANY, LIMITED

The steelworks of William Beardmore and Company, Limited, at Parkhead, Glasgow, specializes in the production of mass as distinct from mass-production. Steel castings up to 150 tons as poured, ingots up to 165 tons, and forgings of like magnitude are its basic commercial products, and the ancillary sections—machine-shops, hammer forges, presses, slab mills and assembly shops—have been developed with these two linked-production units as their backbone.

Melting Shop

The melting shop measures 714 by 177 ft. overall, both foundry and ingot production being served from the same furnaces. An unusual feature in works layout is that the melting shop, being on the further side of a main road from the foundry, necessitates the carriage of molten metal across the road. This is effected at the appropriate times on special ladle bogies carrying up to 60 tons of metal. The time required for tapping foundry metal, its transport to the mould, some 500 yds. distant, and for pouring occupies about 27 minutes overall.

The melting plant consists of five open-hearth acid furnaces of standard design and of the fixed type, three being of 65-tons capacity (at the west end of the shops), one of 45 tons and one of 35 tons. These are fired by raw producer gas from producers situated between the larger and the smaller furnaces. As is usual in shops of this kind, the furnaces are carried centrally on a raised raft running the length of the shop. The furnaces are served on the one side (south) by Wellman crane-type overhead ram chargers. On the other side is the casting pit. Additionally, at the east end of the furnace raft are

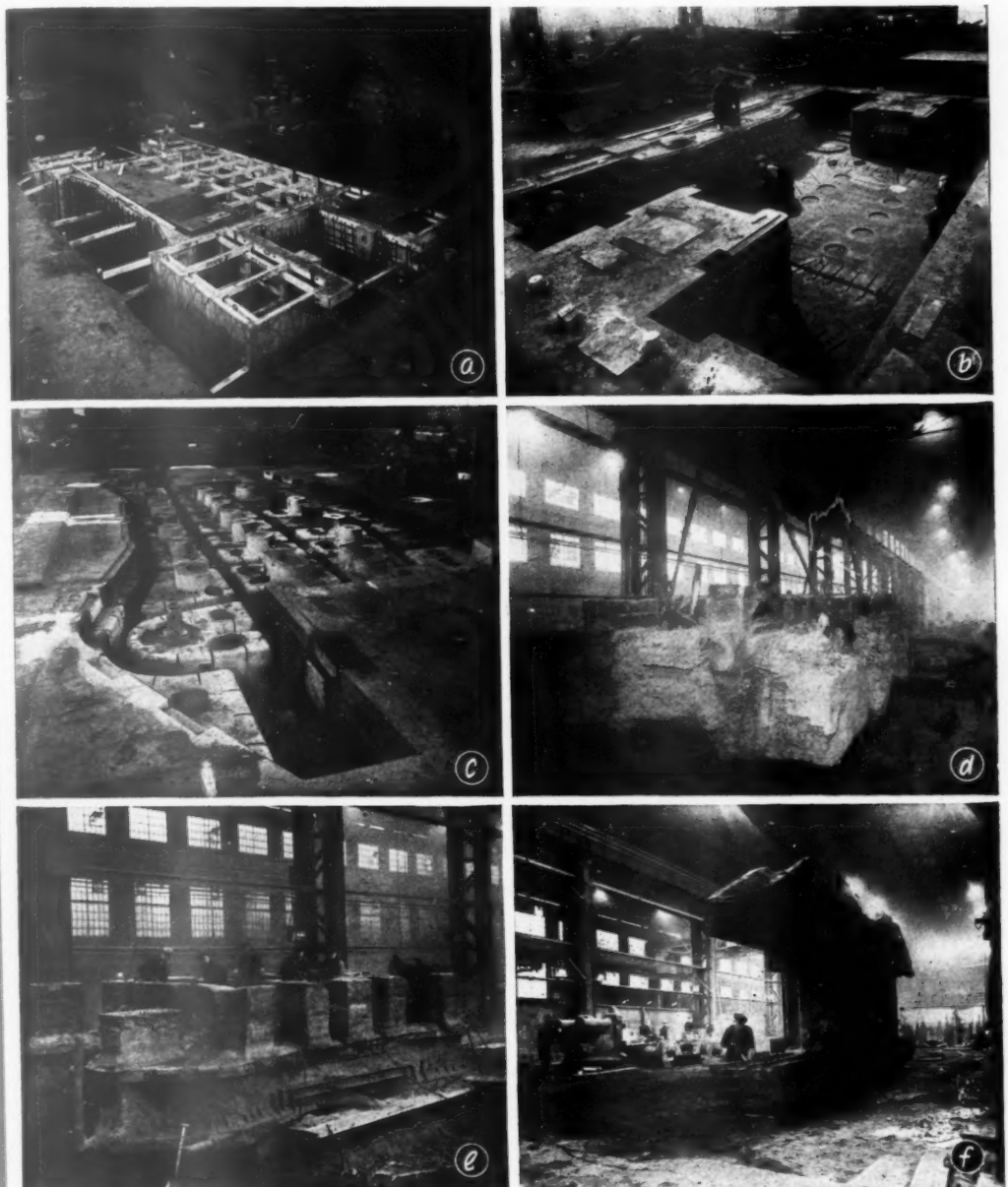


FIG. 14.—*Stages in the production of a* 132*-ton steel casting for a forging press; one of four exported by William Beardmore & Company, Limited, to the United States.*

(a) Pattern in the sand pit ready for moulding (size approx. 30 x 13 x 4 *ft.); (b) finishing the mould; (c) cores in position; (d) casting withdrawn from the mould; (e) and (f) rough dressing before and after removal of the feeding heads.*

FIG. 15.—*General view along the line of mouldin g machines in the mechanized foundry of Mavor & Coulson, Limited.*

two electric-arc melting furnaces, one of 12- and the other of 18- to 20- tons capacity.

Foundry

The foundry proper, where steel castings only equalled in size and weight from one other foundry in Great Britain are made, consists of two parallel bays 75-ft. long, and 74- and 59-ft. wide and 46-ft. high, to eaves, running roughly east and west. The north bay is devoted to moulding and the south to knocking-out, dressing and fettling. At the east end there is a small iron foundry for core-irons and grids, and along the outer wall of the moulding shop there is a sand-preparation plant, a core-making section and a battery of bogie-type core-drying stoves. Centrally, between the bays, are mould-drying stoves and annealing furnaces. These are fired by producer gas, but unlike the melting shop, cleaned gas is used in the foundry, the producers being situated on the north side.

For such large jobs as are generally undertaken by this foundry, pit moulding is practised and most of the operations are carried out manually by highly-skilled operators. There are two permanent moulding pits, with bricked sides, size 30 by 20 by 13 ft. deep which are used for the larger jobs such as rolling-mill housings which require up to 160 tons of liquid metal and 14 semi-permanent pits from 40 by 20 by 6 ft. deep, bricked to requirements. The pit depths depend somewhat on the shop water-level, normally at 14 ft. down; deeper pits need to be waterproofed. There are three moulding machines—plain jolters—with tables 7 ft. 6 in. square, 4 ft. 6 in. square and 4 ft. by 3 ft. 6 in. respectively.

"Moulders' Compo" is the main moulding medium due to its high refractoriness. It is a mixture of dead-burned and raw fireclay with plumbago, and is supplied, ready mixed, to storage bins at the east end. No ingredients except moisture are added to bring it to moulding consistency.

Floor moulds are dried by portable Pneulec units of the coke-fired, forced-draft type operating at 500 to 550 deg. C. The top parts of moulds, drawbacks, and cores are dried in stoves of the solid-bogie type with a winch-operated draw-out.

In the moulding bay are five overhead travelling cranes, two 100-ton capacity, two of 35-tons and one of 20-tons. Of wall cranes, there are two of 5-tons capacity on the north side, and the core-shop has a 10-ton crane operated from floor level. From the moulding bay, castings are transferred to the dressing and fettling bay by means of a heavy-duty, winch-operated bogie. Stages in the production of a large steel casting in Beardmore's foundry are shown in Fig. 14.

Also of major interest at this foundry are the arrangements for bulk annealing, the fettling sections (including large shot-blasting rooms), the patternshop, which was re-built in 1946 and the extensive forge shops, machine-shops and laboratories.

MAVOR AND COULSON, LIMITED

The firm of Mavor and Coulson, Limited, Glasgow, was founded in 1881 by the late Henry A.

Mavor, pioneer in the development of the use of electric light and power. In 1897, the firm began to build electric coal-cutting machines, being the first to manufacture a completely enclosed electric coal-cutter and to incorporate an iron-clad motor in one of these machines. From these beginnings, the manufacture of underground conveyors and loaders developed naturally, from 1908 onwards. The first large-scale troughed-belt conveyor underground in Britain was installed by the firm in 1926. To-day, the products of the firm cover a wide range of coal-cutting, conveying and loading equipment for use underground, and conveyors and loaders for handling material in bulk above ground.

The rapid increase in conveying by troughed belts above and below ground called for high output of cast-iron grit-proof idler rollers, which carry the belt and trough it smoothly, and conveyor driving and idler pulleys. The demand became more than the foundry at Bridgeton could supply and new premises were therefore found nearby, at Swanston, Street, Dalmarnock. A site of three acres was taken over, and is now in process of being developed into a highly-mechanized foundry for the production of cast-iron and non-ferrous castings (Fig. 15).

An area of about two acres is covered in, made up of three bays in which are the mechanized plant, floor-moulding and fettling, coremaking, pattern-shop, and mechanics' workshops. Other buildings house the non-ferrous foundry, pattern-store, laboratory and shot-blast plant. Rumbler houses and a dressing shop for the smaller castings are being built at present. The employees number 250.

Mechanized Section

In the mechanized section, the sand-conditioning plant comprises two 3,000-lb. Simpson type batch mixers, a bucket elevator, rotary screens, storage hoppers and a skip hoist, all installed by August's Limited. Belt conveyors made by Mavor and Coulson distribute the sand. The first belt feeds ten hoppers, supplying the moulding machines; a short conveyor at right angles delivers to a third belt, which feeds hoppers for floor moulding and an impeller rammer. Any sand left on this conveyor passes down a chute to another conveyor, which runs underground and returns the sand by way of the bucket elevator, etc., to the storage hoppers. This belt also conveys reclaimed sand from a static knock-out in the floor-moulding section, and from two vibratory knock-outs in the mechanized section.

FIG. 16.—*Moulds for conveyor rollers being made on one of four B.M. model AT.5 machines at Mavor & Coulson's foundry.*

The mechanized plant is used principally for the production of conveyor idler rollers and the brackets that carry them (Fig. 16). The roller moulds are made on four B.M. model AT5 machines, and the brackets on one AT1, 2 HPL2 and one BT1 machines; the tops are made on a swing-head, squeeze machine. A pallet conveyor takes the boxes first to the pouring station, then to the knock-outs. Two Pneulec 8-tons per hour cupolas, line down to 5 tons per hour, serve the machine moulds. A feature of these cupolas is the wet-type spark arresting equipment installed by the firm. The cupolas are charged by skip-hoists. In the mechanized section, after knocking out, the castings are removed from the knock-outs by an underground M. & C. shaker conveyor, 200-ft. long. The production from this bay is approximately 120 tons per week.

Other Bays

In the floor-moulding section, a large variety of castings is produced, the heaviest weighing 30-cwt. Also in this section there are installed an impeller rammer and a gas-fired tunnel, 20-ft. long, for skin-drying moulds. At present the rammer is used principally in the production of conveyor driving, take-up and snub pulleys. Two 3-ton cupolas, also charged by a skip-hoist, serve this section, and a 30-cwt. cupolette is installed for experimental work.

A third bay is used for coremaking. Here there are a rotary sand drier, several pan mills of M. & C. design, and a Fordath mixer. A number of the cores for the idlers are produced on coreblowers. For drying the roller and bracket cores and most of the pulley cores, three Acme continuous stoves are installed, and there are also two batteries, each of five compartments, of batch-type drying stoves for larger cores and moulds.

Although a considerable reconstruction has been carried out on the site, much that has been planned has still to be completed. In addition to the rumbler and fettling shops mentioned earlier, plans are in hand to make all the cores for the idlers and brackets in the mechanized bay, and to reconstruct the stockyard.

NO FEWER than five new products are being exhibited on the stand of British Insulated Callender's Cables, Limited (No. 27), at the British Electrical Power Convention Exhibition at Eastbourne.

Birthday Honours

A number of people associated with the foundry, iron and steel, and allied industries received awards in the Birthday Honours list, which was published last week. Details of some of the principal awards are given below.

Knights Bachelor

MR. ALFRED CHESTER BEATTY, sen., for public services. He was formerly chairman of the Selection Trust, Limited.

COL. JAMES GEOFFREY BRYDON BEAZLEY, chairman of the Mersey Docks and Harbour Board.

COL. STANLEY BELL, for political and public services in Lancashire. He is a director of Oldham & Son, Limited, Seddon Diesel Vehicles, Limited, and other companies.

MR. JOHN CAMERON, Dean of the Faculty of Advocates and a member of the Industrial Disputes Tribunal.

MR. THOMAS STUART OVERY, for political and public services. He is a director of a number of companies, including Powell Duffryn, Limited, Metropolitan-Vickers-G.R.S., Limited, Crane Packing, Limited, and G. A. Harvey & Company (London), Limited

ALDERMAN PERCY ALAN SANDERS, for political and public services in Essex. He is deputy chairman of Davey, Paxman & Company, Limited, engineers and ironfounders, etc., of Colchester, chairman of E. N. Mason & Sons, Limited.

MR. FREDERICK SCOPES, president of the Joint Iron Council (see page 705 of this issue).

PROF. FRANCIS EUGENE SIMON, Professor of Thermodynamics, University of Oxford.

PROF. ALEXANDER ROBERTUS TODD, Professor of Organic Chemistry, University of Cambridge, and chairman of the Lord President of the Council's Advisory Council on Scientific Policy.

Order of the Bath, Civil Division

K.B.E.

SIR ERIC BLACKLOCK BOWYER, Permanent Secretary, Ministry of Materials, since 1953.

Order of the British Empire (Civil Division)

G.B.E.

CLARENCE NAPIER, BARON ABERDARE, for public services. He is chairman of Duffield, Lindley & Company (Metallurgical & Finance), Limited.

K.B.E.

MAJOR-GENERAL ROBERT CLIVE, VISCOUNT BRIDGEMAN, chairman of Vulcan Foundry, Limited, and a director of Atlas Diesel Company, Limited, Insulation Equipments, Limited, Lobnitz & Company, Limited, engineers, etc., of Renfrew, and other companies.

MR. IVAN ARTHUR RICE STEDEFORD, chairman and managing director of Tube Investments, Limited, chairman of Reynolds Rolling Mills, Limited, and South Wales Aluminium Company, Limited, and a director of Standard Tube & T.I., Limited, Stewarts and Lloyds, Limited, and other companies. He has been a member of the Advisory Council for Scientific and Industrial Research, and in 1945 became a governor of Birmingham University.

O.B.E.

MR. J. B. BROWN, manager, gun-mounting department, Vickers-Armstrong, Limited, Barrow-in-Furness; MR. F. M. COLEBROOK, senior principal scientific officer, National Physical Laboratory, Department of Scientific and Industrial Research. MR. S. CONSTANTINE, a director and general manager of James Dixon & Sons, Limited, cutlers, etc. MR. W. E. FIELD, managing director of H. W. Ward & Company, Limited, machine-tool makers, of Birmingham; MR. F. A. FOORD, lately chief technical adviser to the Principal Director of Engine Research and Development, Ministry of Supply; MR. W. M. HAMPTON, technical director and general manager, Chance Bros., Limited, Birmingham; MR. F. H. LISTER, managing director of R. A. Lister & Company, Limited, engineers and ironfounders, of Dursley (Glos); MR. G. M. L. LOGIE, shipyard manager, Swan, Hunter & Wigham Richardson, Limited, Wallsend-on-Tyne.

MR. T. CAMERON, secretary, Glasgow Chamber of Commerce; MR. H. G. HERRINGTON, managing director, High Duty Alloys, Limited, Slough; MR. J. F. (JACK) TANNER, lately president of the Amalgamated Engineering Union; MR. H. TONGUE, for services as chief engineer, Atomic Energy Research Establishment; MR. H. L. VERRY, assistant secretary, Department of Scientific and Industrial Research; MR. F. S. SNOW, principal, Frederick S. Snow & Partners, consulting engineers, London.

M.B.E.

MR. J. BARNES, manager, metal patternshop, G. Perry & Sons, Limited, Aylestone, Leicester; MR. D. L. BROWNLOW, a director and chief engineer, Mirrlees, Bickerton & Day, Limited, Diesel engine manufacturers, Stockport; MR. E. CRADDOCK, a director and general manager, West Hunswick Silica & Firebrick Company, Limited, Willington; MR. E. CROSS, personnel manager, Richard Thomas & Baldwins, Limited, Ebbw Vale; MR. W. J. DALLAS, head outside engineer and dock superintendent, Yarrow & Company, Limited, Scotstoun, Glasgow; MR. W. MCA. GALL, manager, Barry Graving Dock & Engineering Company, Limited; MR. R. B. NAYLOR, chief inspector, F. H. Lloyd & Company, Limited, steelfounders, Wednesbury; MR. F. ROSTRON, export sales manager, Ferranti, Limited, of Hollinwood; MR. J. H. SAUNDERS, assistant electrical manager, Harland & Wolff, Limited, Belfast; MR. A. I. F. SIMPSON, senior engineer, General Electric Company, Limited, Allesley, Coventry; MR. L. F. SMITH, secretary, Longford Engineering Company, Limited, Bognor Regis (Sussex); MR. E. N. SOUTHALL, a director of Joseph Westwood & Son (Cradley Heath), Limited, manufacturers of chains and cables; MR. J. W. WAGSTAFF, cashier, Hadfields, Limited, steelmakers, etc., of Sheffield.

B.E.M.

MR. A. CLARKSON, blacksmith, Colvilles, Limited, Motherwell; MR. T. DICK, foreman, Victor Products (Wallsend), Limited; MR. G. HILL, foreman, Bray Accessories, Limited; MR. R. G. HOWARD, fields research engineer, Davey, Paxman & Company, Limited, engineers, ironfounders, etc., of Colchester; MR. R. KEMSLEY, chargehand, W. G. Bagnall, Limited, locomotive and railway wagon builders, of Stafford; MR. W. MCCALLUM, draughtsman, Glenfield & Kennedy, Limited, hydraulic engineers and founders, of Kilmarnock; MR. F. MANSELL, coppersmith, Guy Motors, Limited, Wolverhampton; MR. E. MOODY, foreman fitter, Rose Bros. (Gainsborough), Limited, engineers and ironfounders, of Gainsborough (Lincs); MR. G. W. MOORE, patternshop supervisor, Millspaugh, Limited, founders, of Sheffield; MR. P. MOYES, assistant clerk of works, J. & E. Hall, Limited, engineers and ironfounders, of Dartford (Kent); MR. A. N. POWIS, repair manager, J. A. Mulhern & Company, ship repairers, etc., of Liverpool; MR. D. T. WILKINSON, works foreman, Meltham Silica Firebrick Company, Limited, Huddersfield; MR. C. WILLIAMS, foreman, Gloucester Railway Carriage & Wagon Company, Limited, Gloucester; MR. F. WOMERSLEY, foreman, maintenance fitter, Steetley Magnesite Company, Hartlepool.

Hints for Candidates Taking Examinations in Foundry Practice

*By. C. B. Fearnside**

To be successful in any written examination on technological subjects, the following precepts should be carefully followed:—

(1) Be at the examination centre in good time.
(2) Read through the whole paper carefully before starting to write answers.
(3) Number each question and part of a question.
(4) Leave three or four lines between each answer, as it may be desired to add something later.
(5) Answer the easiest questions first.
(6) Answer the correct number of questions.
(7) Answer the question fully, but exclude all padding.
(8) Stick to the gist of the questions, and refrain from giving irrelevant facts.
(9) Check answers before handing in the paper.
(10) A neat, sizeable sketch can often save many lines of writing besides being easier for the examiner to follow.
(11) Remember that good writing and spelling make a paper easier to mark.

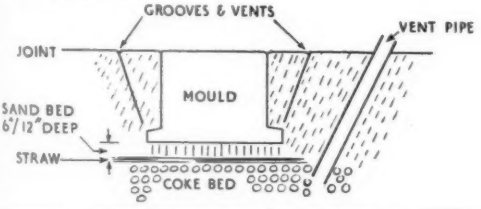
Questions and Answers

Below are printed questions from a recent examination paper and running on are suitable answers:—

Ques. 1.—(*a*) *Describe and illustrate by means of a sketch one method of venting a deep mould;* (*b*) *state the advantages and disadvantages of the method described.*

Ans.—(*a*) The sides can be vented by scraping a groove round the joint about 6 in. from the pattern and pushing down a ¼-in. dia. vent wire from the groove parallel to the pattern at intervals of about 2 in., taking care not to touch the pattern. The bottom faces of a deep mould can be vented by laying down a coke bed in the bottom of a pit. The coke should be three to six inches thick and covered with straw with the bed of sand formed above. It should be well vented with a ¼-in. wire and rubbed over to prevent metal entering the vent holes, see Fig. 1.

FIG. 1.—*Diagram showing the venting of a deep mould* (*Ques.* 1).



(*b*) The advantages of this method of venting are that air and gas can escape freely from all faces of the mould; also, if the coke bed is made low enough, and care is taken to prevent the vent pipes becoming choked, then the bed can be permanent. Where there is any danger of fins or flash at the joint it would be a disadvantage to form grooves as the metal might get into them. A further disadvantage is that if the grooves are too small the gases cannot escape freely.

Ques. 2.—*How is facing sand applied to a pattern and what is the objection to allowing any of the floor sand to come into contact with the pattern, especially in a deep mould?*

Ans.—Facing sand is sieved over small and shallow patterns. Deep patterns have shovelfuls of facing sand placed all around and the sand is "faced-up," or pressed against the pattern, by hand, to about 4 in. deep and 2 in. thick; backing sand is then filled in behind. Floor sand should not come into contact with the pattern because (1) it is weak and may sag or collapse when the pattern is withdrawn; (2) it may contain sprigs, pellets or lumps of dry sand which would spoil the mould face; and (3) this sand has not the properties necessary for it to withstand the heat and pressure of the metal and so erosion and scabbing may occur.

Ques. 3.—*Describe a pouring basin, and state what special care must be taken in its preparation.*

Ans.—A pouring basin is a hollow shape on the top of the mould into which the metal is poured. A hollow scooped out (or formed by the pressure-pad of the moulding machine) in the top face of the mould is sufficient for many types of small castings. Usually, the basin is formed by lining a metal bush or box with sand. The size of the bush varies depending on the size of the casting and the lining may be of green- or dry-sand or for some large important castings loam is used. Good, well-mixed sand should be used which will withstand the flow of the metal. The basin for an iron casting should be rectangular or square, but for steel it is usually round. When preparing a basin, the sides of the box are splashed with clay water so that the sand will stick. The bottom of the basin should be firmly rammed (but not hard) and can be sprigged, or a piece of coke can be set in to take the force of the falling stream of metal. The inside corners must be firm. (See Fig. 2.)

Ques. 4.—*Describe the advantages and disadvantages of natural-bonded and synthetic moulding sand for a modern steel foundry.*

Ans.—Naturally-bonded sand will retain its moisture for a long time and if it should become dry it can be splashed with water to restore its plasticity as, for example, when "mending-up" a mould. Synthetic sand is more friable and more difficult

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FIG. 2.—*Section through a typical pouring basin such as would be used for a medium-weight iron casting (Ques. 3).*

to mend and is, therefore, not so suitable for large moulds. Synthetic sand has a low moisture content compared with naturally-bonded sand and thus the risk of defects due to steam is reduced. These sands lend themselves more readily to quantitative control. Supplies of first-class naturally-bonded sand for steel are in short supply.

Ques. 5.—Mention the important gains and losses that occur during the melting of cast iron and explain the causes of them.

Ans.—During melting in a cupola there will be a gain in carbon, sulphur and phosphorus and a loss of silicon, manganese and iron. An excessive volume of air blast or too low a coke bed will result in heavy loss, due to oxidation. Carbon and sulphur will increase due to "pick-up" from the coke.

Ques. 6.—Describe how you mould the pulley

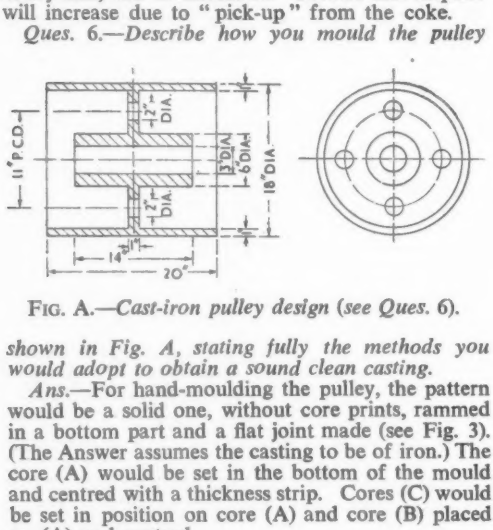


FIG. A.—*Cast-iron pulley design (see Ques. 6).*

shown in Fig. A, stating fully the methods you would adopt to obtain a sound clean casting.

Ans.—For hand-moulding the pulley, the pattern would be a solid one, without core prints, rammed in a bottom part and a flat joint made (see Fig. 3). (The Answer assumes the casting to be of iron.) The core (A) would be set in the bottom of the mould and centred with a thickness strip. Cores (C) would be set in position on core (A) and core (B) placed on (A) and centred.

The centre core (D) would be located in position in (A) through the print in (B) which would have been cut right through. Three wedge runners would be used, spaced about 2-in. apart on the rim and a riser taken off the boss. This would give a clean rim and a sound boss. The cores would be of oil-sand and the mould of green-sand, with plumbago well rubbed in. "Whistlers" would be taken off the rim opposite to the runners and a vent taken through the top part of the core (D) to provide escape routes for gas and air.

Ques. 7.—Give the composition of the metal for:—(a) chilled, cast-iron rolls; (b) light, agricultural castings, and state why any variation in the composition is necessary.

Ans.—Suitable compositions would be:—

	Total Carbon.	Silicon.	Sulphur.	Manganese.	Phosphorus.
(*a*) (per cent.) ..	3.2	0.7	.06	0.3	0.3
(*b*) (per cent.) ..	3.5	2.5	.08	0.7	1.0

The properties of iron vary due to the effect of the various constituents. Since there is a vast difference in the section thickness and qualities required in these two types of castings, there must be a variation in composition, *e.g.*, in chilled rolls the silicon contents must be low to prevent graphitization, but it must be high for light, agricultural castings to promote this phenomenon.

Ques. 8.—(a) Why should steel castings be annealed? (b) Give the temperature for annealing carbon-steel castings. (c) What effect does annealing have on the mechanical properties?

Ans.—(*a*) The "as-cast" structure of steel castings is coarse and brittle. Annealing refines the structure, develops the desired physical properties and relieves stresses set up in the casting during cooling.

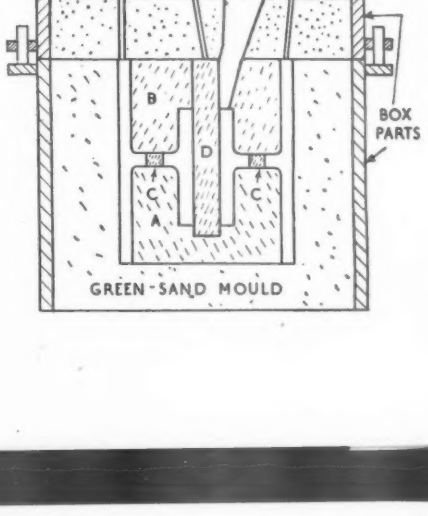
(*b*) The annealing temperature depends on the carbon content of the steel and varies between 850 to 950 deg. C.

(*c*) Annealing of steel castings, induces ductility, increases elongation and impact values, and facilitates machining.

Ques. 9.—State several important requirements to obtain good sound castings in gunmetal.

Ans.—The sand used should be of fine grain and have a low moisture content. Moulds should be evenly rammed and well vented. Risers must be correctly placed and large enough to ensure adequate feeding. Runner basins should be funnel-shaped to allow the metal to flow quickly and freely into the mould. The metal should be melted quickly and not raised to too high a temperature. The correct casting temperature should be used. This varies from 1,150 to 1,200 deg. C., depending on the size and section thickness of the casting.

FIG. 3.—*Diagrammatic section through the mould for the cast-iron pulley shown in Fig. A.*



Personal

LORD ROCHDALE, president of the National Union of Manufacturers, has been appointed a governor of the B.B.C. until 1959.

COUNCILLOR BENJAMIN POLLARD, a director of W. J. Jenkins & Company, gas-appliance engineers, of Retford, has been elected Mayor of Retford.

A. REYROLLE & COMPANY, LIMITED, electrical engineers, Hebburn-on-Tyne, have announced that MR. H. H. MULLENS has been co-opted a director and made managing director.

CARRON COMPANY announce that MR. ROBERT URE, who has been the company's chief chemist, has been appointed blast-furnace manager in succession to his father, who died last March.

MR. P. J. C. BOVILL, an assistant managing director and a local director of Newton, Chambers & Company, Limited, and general manager of the firm's chemicals branch, has been appointed a county magistrate in the West Riding.

MR. THOMAS HOYLAND has retired from the blacksmith's shop at the Thorncliffe works, Sheffield, of Newton, Chambers & Company, Limited, at the age of 73, after 59 years' service. He was presented with a monetary gift from his workmates.

MR. C. F. BARNARD, managing director of Mirrlees, Bickerton & Day, Limited, Diesel-engine manufacturers, of Stockport (Ches), left on June 10 for a 10-week tour of the United States and Canada. He will visit more than 20 towns and cities in search of orders for the company.

SIR HUGH BEAVER, M.INST.C.E., M.I.CHEM.E., has been appointed chairman of the Advisory Council for Scientific and Industrial Research in succession to Professor Sir Ian Heilbron, D.S.O., D.SC., LL.D., F.R.I.C., F.R.S., who retires on September 30, 1954, on completion of his term of office.

SIR BEN LOCKSPEISER, secretary of the Department of Scientific and Industrial Research, will be among those who will receive the honorary degree of Doctor of Science at Oxford University, on the eve of the meeting of the British Association for the Advancement of Science on September 1.

THE AUSTIN MOTOR COMPANY has announced the appointment, effective immediately, of MR. R. W. GRICE as chief experimental engineer for cars and commercial vehicles. Mr. Grice, who is 45, joined the company in 1926. In 1950 he was appointed superintendent of the production and development-road-test section.

MR. N. V. BALDWIN has been appointed managing director of Brookhirst-Igranic S.A. (Pty.), Limited, the South African subsidiary of the electrical division of the group of companies controlled by Metal Industries, Limited. Mr. Baldwin has been connected with the Igranic Electric Company, Limited, Bedford, for more than 40 years.

THE APPOINTMENT of MR. L. R. STOKES as managing director is announced by Bowmaker Plant, Limited, of Willenhall. MR. E. G. BIDDLE, secretary, relinquishes the dual post of secretary-director. This is the first official appointment to the post of managing director since the death of MR. R. V. CABLE in 1953. For the past 10 years, Mr. Stokes has been with Rolls-Royce, Limited.

THE PRESIDENT OF THE BOARD OF TRADE has approved the appointment of MR. J. L. GIRLING—a superintending examiner in the Patent Office—as Comptroller-General of Patents, Trade Marks and Designs in the place of the late Sir John Blake. Mr. Girling joined the Patent Office in 1921 and has worked there throughout his career, apart from a period of war service.

MR. J. VEITCH, chief clerk at the Southwick engine works of George Clarke (1938), Limited, Sunderland, has retired owing to ill health. He was with the group, headed by Richardsons, Westgarth & Company, Limited, for 44 years. Both MR. J. W. DOWNES, leading draughtsman at the works, and MR. W. HALL, senior outside foreman, have retired at the age of 65, after 37 and 40 years' service respectively.

ARMSTRONG WHITWORTH (METAL INDUSTRIES), LIMITED, announce that MR. LEWIS BURN, M.I.MECH.E., M.I.MAR.E., has joined their staff as consultant engineer. Mr. Burn is well known for his development work in connection with gears, and a portion of his work with the firm will be in connection with the further development of the "Burn gear" and also the Beier infinitely-variable gear, for which the company hold a manufacturing and distribution licence for the British Commonwealth.

MR. JACK BARNES, who is included in the list of M.B.E. awards in the Birthday Honours, is manager of the metal pattern department of G. Perry & Sons, Limited, Hall Lane, Leicester. Mr. Barnes served his apprenticeship with the company, and has now completed 35 years' continuous service and, jointly with Mr. Wilfred Perry, was responsible for the production of precision metal patterns used to make manganese-steel track links. He is an associate member of the Institute of British Foundrymen.

MR. G. E. LUNT, works manager of Bradley & Foster, Limited, iron and steel manufacturers, of Darlaston, and a son of a former managing director of the firm, has been appointed to the Board of directors. Also appointed to the Board is COUN. J. L. ALLEN, a member of Tipton Town Council. He joined the firm in 1940 and will continue as company secretary, a post he has held since 1945. Both Mr. Lunt and Coun. Allen have also become directors of Bradley's (Darlaston), Limited, and Bradley's (Concrete), Limited.

Obituary

COL. CYRIL MURTON CROFT, a past-president of the International Gas Union and of the Institution of Gas Engineers, died on June 8 at the age of 66.

MR. F. BARSON, for many years before retirement a departmental manager of Cammell Laird's (now amalgamated with English Steel Corporation, Limited, Sheffield), has died in his 79th year.

THE death took place on June 1 of Colonel Alan Stein, O.B.E., M.C., T.D., D.L., chairman and managing director of John G. Stein & Company, Limited. He was 65 years of age and was associated with the company for over 50 years, succeeding his father as chairman and managing director in 1927.

ON THURSDAY the Third Sea Lord, Vice-Admiral R. A. B. Edwards, is visiting Tyneside when his itinerary will include Clarke, Chapman & Company, Limited, C. A. Parsons & Company, Limited, and the Wallsend Slipway & Engineering Company, Limited. He will be present the next day when Mr. J. P. L. Thomas, First Lord of the Admiralty, performs the opening ceremony of the new 709-ft. dry dock of Smith's Dock Company, Limited.

News in Brief

THE WORKS of Bruce Peebles & Company, Limited, engineers, of Edinburgh, will be closed from July 2 to July 19 for the annual Edinburgh trades holiday.

THE AIR-CONDITIONING PLANT for the new 12-storey administrative buildings of the Ford Motor Company, in Detroit, U.S.A., will be supplied by Thermotank, Glasgow, through its associated company in Michigan. The order is worth approximately six million dollars.

FOUNDRY EQUIPMENT, LIMITED, of Linslade Works, Leighton Buzzard, are exhibiting at the Barcelona Exhibition. The firm has recently completed a fully-mechanized foundry plant in that country. Mr. A. S. Beech, the managing director, is in attendance on the stand.

INSTRUCTIONS to proceed with the building of a steel-melting furnace of 60 tons capacity have been given to Clydesdale Steel Works, Mossend, of Stewarts and Lloyds, Limited. With this extension the works will have five furnaces, with four operating continuously and one off for repairs.

METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED, have received an order, worth over £750,000, for three mill drives for the Lackenby Works of Dorman, Long & Company, Limited, comprising a 40-in. roughing mill, a 53-in. universal beam roughing mill and a 53-in. universal beam finishing mill.

AN ANNUAL EMPLOYERS' "CONGRESS" to which every trading association could send delegates has been suggested by the Dudley branch of the National Union of Manufacturers. A resolution to that effect has been sent to the Midland Council with a view to its being passed on to be discussed on a national basis.

"MODERNIZATION of the Chuckery Foundry, Walsall, and the beginning of production at the new Phœnix Foundry at Lichfield, is putting the old-established business of Chamberlain & Hill, Limited, in a strong position," Mr. G. A. L. Hatton said in his annual review. The Chuckery Foundry has been reconstructed so as to double production capacity.

WHAT IS CLAIMED TO BE a revolutionary departure from orthodox chain conveying is the selective automatic system, known as the "Stanrun" system, currently being shown by Geo. W. King, Limited, Stevenage, Herts, at the Mechanical Handling Exhibition. Photographs are exhibited of the "Stanrun" in use at the Austin Motor Company, Limited.

FIELD-MARSHAL VISCOUNT MONTGOMERY, on June 10, visited the Rolls-Royce works, Derby, and made a tour of the apprentice school, the production departments, engine assembly shops, the aero-engine test beds, and also the experimental and research department. He was accompanied by Lord Hives, chairman and joint managing director of Rolls-Royce, Limited.

A CHEQUE for 50 guineas was presented to Mr. H. C. Chamberlain, for 35 years secretary of the employers' side of the West Midlands Joint Industrial Council, at the Council's annual meeting at Leamington on June 9 when his retirement was announced. A native of Walsall, who has lived in Birmingham for many years, Mr. Chamberlain is moving to Somerset on his retirement.

WORK on the new £30,000 laboratories for the Midland section of Richard Thomas & Baldwins, Limited, is now well under way at Brierley Hill. It is expected that they will be finished by the autumn. They have been designed to meet the overall research requirements of the company's four Midland factories, a service hitherto provided by small laboratories at the Stour Vale Works, near Kidderminster.

A VERY ATTRACTIVE booklet has been got out for the 51st annual conference of the Institute of British Foundrymen. A cut-out on the front cover shows the Scottish Lion backed by a silk tartan, Royal Stuart design. The book contains excellent maps—always excellent publicity—and interesting historical descriptions of Glasgow and Edinburgh. Obviously, it also carries detailed programmes of all the events of the Conference to be held in Glasgow next week.

WORKERS at the Witton, Birmingham, works of Imperial Chemical Industries, Limited, gave a send-off last Friday to the company's locomotive 1439, when it made the last journey inside the works before going to rest in the British Transport Commission's museum of historic relics. The locomotive was built in 1865, and until 1914, when it was taken to Witton, it ran as a shunting engine on the old London and North Western Railway. It was one of the 36 0-4-0 engines built by the famous John Ramsbottom.

THE EUROPEAN PRODUCTIVITY AGENCY which lists the Birmingham University Institute as giving "courses in industrial engineering" has allocated funds to send simultaneous-translation equipment and interpreters to the Institute, where all lectures are in English with a simultaneous translation in French available on headphones. The Institute was established to give short residential courses for senior industrial executives and specialists in work study, operational research and allied subjects bearing upon productivity. It has now held 15 courses.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, announce that Mr. J. S. Makin has been appointed manager of their Manchester office. BRITISH INSULATED CALLENDER'S CONSTRUCTION COMPANY, LIMITED, announce the receipt from the Iraq Development Board of an order, worth £69,000, for the supply of six Callender-Hamilton bridges. Designed to carry full Ministry of Transport loading, the bridges will provide a double carriageway 24-ft. wide, together with footways for pedestrian traffic cantilevered outside the main girders.

EKCO ELECTRONICS, LIMITED, has secured an order from the Carborundum Company, of Niagara Falls, New York, for a thickness-gauge installation. This order is believed to be the first of its kind in the industrial nucleonics field to be placed by the U.S. with a British firm, and has been obtained despite keen American and German competition. The installation includes a number of thickness gauges with automatic control equipment and traversing mechanisms, and will be used for measuring "Carborundum"-coated abrasive products during various stages of manufacture.

SOARING 615 ft. above a base 22-ft. high, the chimney for the iron-ore plant of the International Nickel Company of Canada, Limited, will take the title of "tallest in the British Commonwealth" which for many years has been held jointly by the two 500-ft. stacks at Inco's Copper Cliff smelter. The great height of the chimney at the new plant is to ensure proper diffusion of waste gases in the upper atmosphere. The new plant will, it is claimed, make metallurgical history by recovering high-grade by-product iron-ore from nickel ores mined in the Sudbury district.

A DISTRIBUTIVE FACTORY BRANCH for motor-cycles, cycles and rifles has been acquired in America by the B.S.A. Group, it was announced recently. The company has bought the property and goodwill of the Rich Child Cycle Company Inc., the existing B.S.A. distributors for the Eastern states. Mr. James Leek the managing director of the Small Heath group of the B.S.A. Company, Limited, has recently returned from a visit to America and Canada. He found that since the victory of the company in the Daytona 200-miles classic in which their machines took the first five places, the demand for the firm's motor-cycles had increased substantially.

A VALUABLE CONTRACT for hydro-electric generating plant has been secured from Jamaica by the Harland Engineering Company, Limited, of Alloa. The equipment, which will take two years to complete, is to be installed in a new power station being built for the Rio Bueno scheme, one of several projects designed to aid Jamaican industrialization. The Alloa firm, which employs 800 workers, were responsible for equipping the Lower White River generating station in Jamaica. The firm, which has supplied a large quantity of machinery for the North of Scotland Hydro-Electric Board schemes, is also engaged at present on hydro-electric plant for Australia and Africa.

MEMBERS of the Allied Ironfounders Angling Club left Falkirk recently to fish the fourth competition for the Hill Cup on a private stretch of the River Tummel at Ballinluig. Competitors, on arrival, encountered a fast-running river and flood water from the previous night's heavy rain, but conditions overhead were bright, with a strong, warm sun. The total of fish caught was ten trout weighing 5 lb. 1 oz. The winner was Mr. R. Anderson with 1 lb. 5 oz. The position in connection with the Hill Cup, which is awarded for the highest aggregate for the season is now:—(1) A. Reid (Dobbie, Forbes), 3 lb. 7 oz.; (2) D. Cox (Allied, Office), 3 lb. 6 oz. and (3) A. Morrison (Forth & Clyde & Sunnyside), 3 lb. 1 oz.

A ONE-DAY CONFERENCE on "National Service and Industry" is to be held at the Botanical Gardens, Birmingham, on June 23, organized by the West Midlands Group of the British Association for Commercial and Industrial Education in collaboration with the War Office, the Admiralty, the Air Ministry, and the Birmingham branch of the Institute of Personnel Management. Senior officers of the three services are to address the conference, which it is expected will be attended by some 200 representatives from local industry. One of the themes of the conference is the methods that industry can use to help its young men to derive the maximum benefit from their period of national service.

THE BRITISH TRANSPORT COMMISSION announce that as part of the £2-million programme for the development of lightweight Diesel trains on British Railways, an order has been placed with the Metropolitan-Cammell Carriage & Wagon Company, Birmingham, for 36 motor vehicles and 36 driving trailers. These units will be fitted with A.E.C. engines and Wilson gearbox transmission (the latter made by Self Changing Gears, Limited, Coventry). The first B.R. lightweight Diesel train to be completed under the overall programme was demonstrated in the London area on April 29; public services were begun in the North Eastern Region on June 14, with units constructed at the Derby works.

RESEARCH into the effectiveness of incentive payment schemes in increasing productivity which has been carried out at Birmingham University under the supervision of Professor Sargant Florence, is recorded in the recently issued first report of the Human Relations in Industry Committee appointed last year by the Medical Research Council and the Department of Scientific and Industrial Research. The project being carried out by the Faculty of Commerce and Social Science at Birmingham University will lead to the assembly and analysis of factory experience in Midlands industry concerning the effect of incentive schemes on productivity, chiefly in terms of output, employee turnover and absenteeism. An attempt is also being made to take into account trade union attitudes and experience.

ALUMINIUM LABORATORIES, LIMITED, the research, engineering and geological exploration unit of Aluminium, Limited, announce the completion of the new extensions to their research laboratories at Banbury, Oxon. The new facilities, construction of which was begun in 1951, have cost over £300,000; they add a further 44,000 sq. ft. to the floor area of the older building and a total area of 65,000 sq. ft. is now available. The buildings were designed by Sir Percy Thomas & Son, of Cardiff, and incorporate many of the latest developments in laboratory design. Aluminium Laboratories at Banbury, with a staff of almost 200, conduct basic and applied research in the light-metal field. They also engage in the investigation of technical problems in the fabricating and sales fields for the benefit of associated companies in the Aluminium, Limited, organization, including Northern Aluminium Company, Limited, the largest fabricating unit in the group, and Aluminium Union, Limited, the international trading company.

J.I.C. and B.C.I.R.A. President Honoured

Mr. Frederick Scopes, president of the Joint Iron Council, upon whom the conferment of a knighthood was announced in the Queen's Birthday Honours List, was educated at King Edward's School, Birmingham, and from there he obtained an open scholarship in modern history at Corpus Christi College, Oxford. Early in 1914, Mr. Scopes was invited to join the secretarial department of Stewarts and Lloyds, Limited, in Glasgow, and thereafter he was closely associated with many of the firm's developments, particularly those at Corby. On the outbreak of war in 1939, his services were requested by the first Iron and Steel Controller, and Mr. Scopes became Director of Home Ore Production, which position he retained until he took up the appointment of deputy managing director at Stanton Ironworks Company, Limited, in 1941. A few months later he was appointed managing director of Stanton and its subsidiaries. Amongst his many other business interests, he is a managing director of Stewarts and Lloyds, Limited, chairman of the British Coking Industry Association, and president of the British Cast Iron Research Association.

Raw Material Markets

Iron and Steel

While it is perhaps still too early to estimate what effect the increased price of pig-iron will have on the foundry trade, it is generally agreed in trade circles that the increase has come at an inopportune time. Dearer pig-iron will inevitably mean dearer castings, as the foundries absorbed some of the earlier advances and the buyer will now have to pay more. Consumers of castings, on the other hand, have been urging the foundries to reduce their prices in view of the severe competition they are having to meet from the Continent. Some foundries have, in fact, in the past had to take business at reduced figures in order to keep their plants in operation.

The light foundries are especially concerned about the future demand for castings, particularly those catering for the domestic equipment trade; they are already short of business and many are confined to a four-day working week.

Activity among the jobbing foundries is variable, but most of them are in need of fresh business. The demand for high-phosphorus pig-iron for both the light and jobbing foundries is steady, most users being content to specify only for tonnages to implement orders on hand. In fact, in some instances orders for pig-iron previously booked have been cancelled or suspended, business not having developed as well as had been expected.

The engineering and speciality foundries, while not heavily engaged, continue to obtain a fair level of output and are receiving good support from the motor and allied trades for both home and export requirements. Those foundries which cater for the machine-tool trade, heavy electrical equipment makers, and the busy home trades are also returning quite a high output. The demand from these foundries for the low- and medium-phosphorus grades of pig-iron is greater than present production can satisfy. The supply of hematite is also rather difficult, particularly in regard to the higher silicon ranges, while many producers have commitments with the steelworks which preclude their meeting the full requirements of the foundries.

The supply of scrap is sufficient to meet current consumption. Light scrap is fairly plentiful, but there is a good demand for the heavier and better grades of cast-iron and machinery scrap. Foundries have little difficulty in obtaining foundry and furnace coke, ganister, limestone, and firebricks.

The re-rollers are somewhat better situated for work, particularly in regard to strip. There has been a marked improvement in recent weeks for all qualities of strip both for home and export markets, so that shortly the demand for steel semis should improve. There are also signs of better business for small bars for both home and overseas, but the increased call is not so pronounced as in the case of strip. The sheet re-rollers are very busy, and demands for sheet bars have increased. To cover the recent improvement in the call for small bars and light sections, the demand for billets is heavier than for some time past and home steelworks are fulfilling present demands without much difficulty, apart from the untested grade of steel, which many of them are not prepared to undertake, although a larger proportion of this grade would be preferred by the re-rollers.

Non-ferrous Metals

Influenced, perhaps, by the Whitsun holiday, which cut down trading on the Metal Exchange to four days, there was a somewhat easier trend in metals last week, but on Friday an improvement set in which affected values both at midday and in the afternoon. News from the United States is somewhat conflicting and there seems to be a certain amount of disappointment over the way the stockpiling programmes for lead and zinc are hanging fire. It is true that an announcement has been made, but details are lacking and those who were hoping to see the current value of these two metals perhaps 1 cent higher are not so optimistic now about the prospects for a further advance.

Lead on the New York Commodity Exchange last week showed an easy tendency. Sentiment in zinc was adversely affected by a rise to 209,828 tons in stocks in producers' hands at the end of May. A fall had been predicted and an increase of 9,000 tons was a big disappointment to those who have been taking an optimistic view of the outlook.

Copper holds steady at 30 cents (£240), but the London market at £238 10s. is now below this parity, although Continental buyers are paying £5 or £6 more than this.

There are suggestions that a revision of the L.M.E. standard copper contract is in contemplation, but, so far, nothing has been announced.

On the London Exchange turnovers were below average if only on account of the shorter trading week, but, with the exception of zinc, values improved on the week.

In copper last week there was a widening in the backwardation from the low point of 10s. to 30s. at the close of business on Friday, when cash registered a gain of 10s. and three months 15s. However, the market closed above the worst. Zinc also recovered, although on balance there were losses of 17s. 6d. and 15s. in the respective positions. Lead gained £1 for June, but only 10s. for September, and the backwardation widened to £3. Tin, also improving to a modest extent, was £5 10s. up for cash and £4 10s. better for three months.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* June 10, £236 15s. to £237; June 11, £237 10s. to £238; June 14, £238 10s. to £239; June 15, £239 10s. to £239 15s.; June 16, £239 15s. to £240.

Three Months: June 10, £236 to £236 5s.; June 11, £236 10s. to £236 15s.; June 14, £237 to £237 5s.; June 15, £237 15s. to £238; June 16, £237 15s. to £238.

TIN, Standard—*Cash:* June 10, £727 to £727 10s.; June 11, £723 10s. to £724; June 14, £725 to £726; June 15, £723 10s. to £724; June 16, £724 to £724 10s.

Three Months: June 10, £726 to £726 10s.; June 11, £723 to £723 10s.; June 14, £725 to £726; June 15, £722 10s. to £723; June 16, £724 to £724 10s.

ZINC—*June:* June 10, £80 to £80 2s. 6d.; June 11, £80 2s. 6d. to £80 5s.; June 14, £79 15s. to £80; June 15, £79 5s. to £79 7s. 6d.; June 16, £79 to £79 5s.

First half September: June 10, £80 2s. 6d. to £80 5s.; June 11, £80 7s. 6d. to £80 10s.; June 14, £80 2s. 6d. to £80 5s.; June 15, £79 7s. 6d. to £79 10s. *Second half September:* June 16, £79 5s. to £79 10s.

LEAD—*First half June:* June 10, £97 to £97 10s.; June 11, £98 5s. to £98 10s.; June 14, £99 to £99 5s.; June 15, £96 15s. to £97 5s. *Second half June:* June 16, £95 to £95 10s.

First half September: June 10, £94 10s. to £94 15s.; June 11, £95 to £95 5s.; June 14, £95 5s. to £95 15s.; June 15, £94 to £94 5s. *Second half September:* June 16, £93 5s. to £93 10s.